STATE BOARD OF TECHNICAL EDUCATION, BIHAR

Scheme of Teaching and Examinations for
IVth Semester Diploma in Civil Engineering/Civil (Rural) Engineering
(Effective from Session 2020-21 Batch)
Rev 1.0 THEORY

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME							
			Periods per Week	Hours of Exam.	Teacher's Assessment(TA) Marks A	Class Test(CT) Marks B	End Semester Exam.(ESE) Marks C	Total Marks(A+B+C)	Pass Marks ESE	Pass Marks in the Subject	Credits
1.	Hydraulics	2015401	03	03	10	20	70	100	28	40	03
2.	Advance Surveying	2015402	03	03	10	20	70	100	28	40	03
3.	Theory of structure	2015403	03	03	10	20	70	100	28	40	03
4.	Building Planning and Drawing	2015404	03	04	10	20	70	100	28	40	03
5.	Transportation Engineering	2015405	03	03	10	20	70	100	28	40	03
		Total:-	15				350	500			15

PRACTICAL

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Hours of Exam.	Practical(ESE)		Total Marks (A+B)	Pass Marks in the Subject	Credits
					Internal(PA) A	External(ESE) B			
6.	Hydraulics Lab	2015406	02 50%Physical 50% Virtual	03	15	35	50	20	01
7.	Advance Surveying Lab	2015407	02 50%Physical 50% Virtual	04	15	35	50	20	01
	Total :-		04				100		02

TERMWORK

Sr. No.	SUBJECT	SUBJECT CODE	TEACHING SCHEME	EXAMINATION-SCHEME				
			Periods per Week	Marks of Internal Examiner(PA) X	Marks of External Examiner(ESE) Y	Total Marks (X+Y)	Pass Marks in the Subject	Credits
8.	Theory of structure Lab(TW)	2015408	04	07	18	25	10	02
9.	Building Planning and Drawing(TW)	2015409	04	15	35	50	20	02
10.	Transportation Engineering Lab(TW)	2015410	02	07	18	25	10	01
11.	Course AutoCAD/STAAD. Pro/ Others(TW)	2015411	04	15	35	50	20	02
	Total :-		14			150		07
Total Periods per week Each of duration One Hour			33	Total Marks=		750		24

HYDRAULICS

SubjectCode 2015401	Theory						Credits
	No.of Periods PerWeek			FullMarks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CourseObjective:

1. Tounderstandparametersassociatedwithfluidflowandhydrostaticpressure.
2. Toknowheadlossand water hammer influidflowingthroughpipes.
3. Tolearndifferent types ofpumpsandtheiruses

CONTENTS:THEORY

	Nameof theTopic	Hrs.
Unit-1	**PressuremeasurementandHydrostaticpressure**	08
	1.1 Technical termsusedinHydraulics–fluid, fluidmechanics,hydraulics, hydrostaticsandhydrodynamics–ideal andrealfluid,applicationofhydraulics.	
	1.2 Physicalpropertiesoffluid– density,specificvolume,specificgravity,SpecificWeight,relativedensity,compressibility, cohesion,adhesion,surfacetension,capillarity,viscosity-Newton'slaw ofviscosity.	
	1.3 Varioustypesofpressure–AtmosphericPressure,GaugePressure,AbsolutePressure, Vacuum Pressure. Concept ofPressure head and its unit, Conversion fromintensity of pressure to pressure headandvice-versa,Formulaand Simple problems,Pascal'slaw offluid pressure andits uses.	
	1.4 MeasurementofdifferentialPressurebydifferentmethods.	
	1.5 Variationofpressurewithdepth,Pressurediagram,hydrostaticpressureandcenterofpressur eonimmersed surfaces and ontankwalls.	
	1.6 DeterminationoftotalpressureandcenterofpressureonsidesandbottomOfwatertanks,sides andbottomoftankscontainingtwoliquids,verticalsurfaceincontact withliquidoneither side.	
Unit-2	**FluidFlowParameters**	10
	2.1 Typesofflow,Gravityandpressureflow,Laminar,Turbulent,Uniform,non- uniform,Steady,Unsteadyflow. Reynoldsnumber.	
	2.2 Dischargeanditsunit,continuityequationofflow.	
	2.3 Energyofflowingliquid:potential,kineticandpressureenergy.	
	2.4 Bernoulli'stheorem:statement,assumptions,equation.	
	2.5 Application of Bernoulli's theorem: Venturi meter , Orifice meter, Pitot Tube	
	2.6 Momentum Equation.Simplenumericalproblemsbasedonabovetopics.	

Unit–3	**Flow throughpipes**	
	3.1 Majorheadlossinpipe:Frictionallossanditscomputationby Darcy'sWeisbachequation,Use ofMoody'sDiagram.	10
	3.2 Minorlossesinpipe:lossatentrance,exit,suddencontraction,suddenenlargementandfittings.	
	3.3 Flowthroughpipesinseries,pipesinParallelandDupuit'sequationforequivalentpipe.	
	3.4 Hydraulicgradientlineandtotal energyline.	
	3.5 Water hammerinpipes:CausesandRemedialmeasures.	
	3.6 Dischargemeasuringdeviceforpipeflow:Venturimeter -constructionandworking.	
	3.7 DischargemeasurementusingOrifice,HydraulicCoefficientsofOrifice.Simplenumerical problemsbasedon above topics.	
Unit– 4	**.FlowthroughOpen Channel**	
	4.1 Comparisonof PipeFlow&OpenChannelflow.	
	4.2 Classification of Channel, Classification of flow, Geometrical properties of channelsection:Wettedarea,wettedperimeter,hydraulicradiusforrectangularandtrapezoidal channelsection.	
	4.3 DeterminationofdischargebyChezy'sequationandManning'sequation.	08
	4.4 ConditionsformosteconomicalRectangularandTrapezoidalchannelsection.	
	4.5 SpecificEnergyDiagram,Froude'sNumberanditssignificance.	
	4.6 Critical,Sub-Critical&SuperCriticalFlowinChannel.	
	4.7 HydraulicJumpanditsoccurrenceinthefield.PracticalapplicationsofHydraulicJump.	
	4.8 Dischargemeasuringdevices:TriangularandrectangularNotches,Derivationofequationsfor discharge,Comparison of Rectangular&V-Notch.	
	4.9 Velocitymeasurementdevices:currentMeter,floatsandPitot'stube.Simple NumericalProblemsbasedonabovetopics.	
Unit– 5	**HydraulicMachines**	
	5.1 Conceptofpump,Typesofpump-Centrifugal,Reciprocating,submersible.Advantages&Disadvantages, Priming.	12
	5.2 Suctionhead,deliveryhead,statichead,Manometrichead.	
	5.3 Powerofcentrifugal pump.	
	5.4 Selectionandchoiceofpump.	
	5.5 Turbines:Definition&Types.DifferencebetweenPump&Turbines.	
	Total	48

SuggestedText Book:

1. Modi,P.N.andSeth,S.M.,HydraulicsandFluidMechanics,Standardbookhouse, Delhi

2. R.K.Bansal,AText bookof FluidMechanics &Hydraulic Machines,LaxmiPublications Pvt.Ltd.

3. R.L.Anand,Hydraulics,FoundationPublishingHouse.

COURSEOUTCOMES(COs):

1:Measurepressureanddeterminetotalhydrostaticpressurefordifferentconditions.2:

Understand variousparametersassociated withfluidflow.

3: Determine head loss of fluid flow through

pipes.4:Findthefluidflowparametersinopenchannels

.

5:Selectrelevanthydraulicpumpsfordifferentapplications**.**

CO PO MAPPING

Co Number	CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
C2015401.01	Measurepressureanddeterminetotalhydrostaticpressurefordifferentconditions	3	2	-	-	1	-	-
C2015401.02	Understand variousparametersassociated withfluidflow.	3	1	1	-	-	-	2
C2015401.03	Determine head loss of fluid flow through pipes.	3	2	-	-	-	-	1
C2015401.04	Findthefluidflowparametersinopenchannels.	3	2	1	1	1	-	-
C2015401.05	Selectrelevanthydraulicpumpsfordifferentapplications**.**	2	1	-	-	-	1	2
Average		2.8	1.6	1	1	1	1	1.66

ADVANCESURVEYING

SubjectCode 2015402	Theory						Credits
	No.of Periods PerWeek			FullMarks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CourseObjective:

- To knowmethods of planesurveying and Theodolite surveying and their uses.
- Tolearntacheometricsurveying andcurvesetting
- To understand the principles of Electronic Distance Measurement equipment and totalstation and theiruse.
- Toknowthe conceptofremotesensing, GPSandGIS

Contents:Theory

	NameoftheTopic	Hrs.
Unit-1	**PlaneTable Surveying:** 1.1 Principles of plane table survey. Accessories of plane table and their use, Telescopicalidade. 1.2 Settingofplanetable;Orientationofplanetable-BacksightingandMagneticmeridianmethod. 1.3 Methodsofplanetablesurveys-Radiation,IntersectionandTraversing. Meritsanddemeritsofplanetablesurvey.	10
Unit-2	**TheodoliteSurveying:** 2.1 TypesandusesofTheodolite,ComponentsoftransitTheodoliteandtheirfunctions,Reading the VernieroftransitTheodolite. 2.2 TemporaryadjustmentoftransitTheodolite. 2.3 Measurementofhorizontalangle-DirectandRepetitionmethod,Errorseliminatedby methodofrepetition. 2.4 MeasurementofverticalAngle. 2.5 Traversecomputation-Latitude,Departure,Consecutivecoordinates,independentcoordinates,balancingthetra versebyBowditch'sruleandTransitrule,Gale's Traversetablecomputation.	12
Unit– 3	**TacheometricSurveyingandCurve Setting:** 3.1 Principlesof Tacheometry,Tacheometeranditscomponentparts,Anallaticlens. 3.2 Tacheometric formula for horizontal distance with telescope horizontal and staffvertical. 3.3 Field method for determining constants of tacheometer, determining horizontal andvertical Distances with tacheometer by fixed Hair method and staff held vertical,Limitationsoftacheometry. 3.4 Typesofcurvesusedinroadsandrailwayalignments.Designationofcurves.Setting simple circular curve by offsets from long chord and Rankine's method of deflectionangles.	10

Unit– 4	**AdvanceSurveyingEquipment's:**	
	4.1 PrincipleofElectronicDistanceMeter(EDM)itscomponentpartsandtheirFunctionsuseof EDM.	08
	4.2 UseofElectronicDigitalTheodolite.	
	4.3 UseofTotal Station,Use offunctionkeys.	
	4.4 MeasurementsofHorizontalangles,verticalangles,distancesandcoordinatesusingTotal Station, Traversing, ProfileSurvey and ContouringwithTotal Station.	
Unit–5	**RemoteSensing,GPSandGIS:** 5.1 RemoteSensing–	
	Overview,Remotesensingsystem,ApplicationsofremotesensinginCivilengineering.	
	5.2 UseofGlobalPositioning System(G.P.S.)instruments.	08
	5.3 Geographic Information System (GIS): Over view, Components, Applications, SoftwareforGIS.	
	5.4 IntroductiontoDroneSurveying.	
	Total	48

COURSEOUTCOMES(COs):

- PrepareplansusingPlaneTableSurveys.
- PrepareplansusingTheodolitesurveys.
- FinddistancesandelevationsusingTacheometer.
- Prepareplans usingTotalStationinstrument.
- LocatecoordinatesofstationsusingGPS.

CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015402.01	PrepareplansusingPlaneTableSurveys.	-	-	-	-	3	-	1
C2015402.02	PrepareplansusingTheodolitesurveys	1	3	-	-	-	-	-
C2015402.03	FinddistancesandelevationsusingTacheometer	1	3	-	-	-	-	-
C2015402.04	Prepareplans usingTotalStationinstrument	2	-	-	2	-	-	-
C2015402.05	Locate coordinates of stations using GPS.	-	-	1	3	1	-	-
Average		1.33	3	1	2.5	2		1

SuggestedText Book/ReferenceBook:

1. Kanetkar T.P.; Kulkarni S.V., Surveying and Levelling PartIandII, Pune Vidyarthi Gruh Prakashan,Pune.
2. BasakN.N., SurveyingandLevelling,McGrawHillEducation(India)Pvt.Ltd.,Noida.
3. DuggalS.K., SurveyIandSurvey II,TataMcGraw HillEducationPvt.Ltd.Noida.
4. SaikiaMD.;Das. B.M.;Das.M.M.,SurveyingPHILearningPvt.Ltd.,NewDelhi.
5. R.,SurveyingandLevelling, OxfordUniversityPress.NewDelhi.
6. Punnia, B.C., Jain, Ashok Kumar, Jain Arun Kumar, Surveying Vol-I and II,Laxmi,Publication Pvt. Ltd, New Delhi.
7. SwetaKumari,Advance Surveying,FPH
8. P.L.Bhatia, AdvanceSurveying ,FPH

THEORY OF STRUCTURE

SubjectCode 2015403	Theory						Credits
	No.of Periods PerWeek			FullMarks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CourseObjective:

- Tolearnconceptofeccentricloadingandstresses inverticalmembers likecolumn,chimneys,dam.
- Toanalyzebeamsusingvariousmethodslikeslopedeflection,threemomentandmomentdistribution.
- Tounderstanddifferentmethodsoffindingaxialforcesintrusses.

Contents:Theory

	NameoftheTopic	Hrs.
Unit-1	**DirectandBending stresses in Verticalmembers:** 1.1 Conceptofdirectandeccentricloads,eccentricityaboutoneprincipalaxis,natureofstresses,maximum andminimumstresses,resultantstressdistributiondiagram. 1.2 Conditionfornotensionorzerostressatextremefiber,Limitofeccentricity,coreof section forrectangularand circularcrosssections,Middlethirdrule. 1.3 Column,pillar,chimneyofuniformcrosssectionsubjectedtolateralwindpressure,Coefficientofwindresistance&resultantstressdistributionattheirbases.	08
Unit-2	**Slopeand deflection:** 2.1 Conceptofslopeanddeflection,stiffness ofBeam. 2.2 Relation between bending moment, slope, deflection & radius of curvature(noderivation) 2.3 Doubleintegrationmethodtofindslopeanddeflectionofsimplysupportedandcantilever beamsubjectedto concentratedanduniformly distributedload. 2.4 Macaulaymethodtofindslopeanddeflectionofsimplysupportedandcantileverbeamsubjectedtoconcentratedand uniformlydistributedload.	10
Unit−3	**Fixedandcontinuous Beam:** 3.1 DifferenttypesofDeterminate&IndeterminateStructures&Stabilityofstructure. 3.2Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam oversimplysupportedbeam. 3.3 Principleofsuperposition,Fixedendmomentsfromfirstprincipleforbeamsubjectedto pointload,UDLoverentire span. 3.4 Applicationofstandardformulaeinfindingendmoments,endreactionsanddrawing S.F. and B.M. diagrams for a fixed beam. (Derivation need not to be askedin exam). 3.5 Clapeyron's theorem of three moments (no derivation). Application of theoremmaximum up to three spans and two unknown support moment only, Support at samelevel, spans having same & uniform moment of inertia subjected to concentrated loadsanduniformly distributedloadsoverentire span. 3.6 DrawingSF &BMdiagramsshowingpointofcontraflexureforcontinuousbeams.	14
Unit−4	**Momentdistributionmethod:** 4.1 Introduction,signconvention. 4.2 Carryoverfactor,stiffnessfactor,Distributionfactor. 4.3 Applicationofmomentdistributionmethodforvarioustypesofcontinuousbeamssubjectedtoconcentratedloadsanduniformlydistributedloadoverentirespan havingsameordifferentmomentofinertiauptothreespansandtwounknownsupportmomentonly.	10
Unit−5	**Simpletrusses:** 5.1 Typesoftrusses(Simple,Fink,compoundfink,Frenchtruss,pratttruss,Howetruss, Northlighttruss, Kingpostand Queenposttruss). 5.2 Calculatesupportreactionsfor trussessubjectedtopoint loadsatjoints 5.3 CalculateforcesinmembersoftrussusingMethodofjointsandMethodofsections.	06
	Total	48

COURSEOUTCOMES(COs):

1. Analyzestressesinducedinverticalmembersubjectedtodirectandbendingloads.
2. AnalyzeslopeandDeflectioninfixedandcontinuousbeams. and compare with permissible limits according to IS code
3. AnalyzecontinuousbeamusingMomentDistributionMethodunderdifferentloadingconditions.
4. Evaluateaxialforcesinthemembersofsimpletruss.

CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015403.01	Analyze stresses induced in vertical member subjected to direct and bending loads	2	3	-	-	-	-	-
C2015403.02	Analyze slope and Deflection in fixed and continuous beams. and compare with permissible limits according to IS code	1	3	1	-	2	-	1
C2015403.03	Analyze continuous beam using Moment Distribution Method under different loading conditions.	2	3	1	-	-	-	-
C2015403.04	Evaluate axial forces in the members of simple truss.	1	3	3	-	-	-	2
Average		1.5	3	1.66		2		1.5

SuggestedTextBook:

1. Theoryofstructures,S.Ramamrutham,Dhanpatrai&Sons.
2. Mechanicsofstructures,S.B.JunnarkarCharotarPublishingHouse,Anand.
3. AnalysisofStructuresV.N.Vazirani&M.M.Ratwani
4. TheoryofStructuresR.S.Khurmi,S.ChandandCo.,NewDelhi.
5. TheoryofStructure,R.S.Guha,FPH

BUILDINGPLANNINGANDDRAWING

SubjectCode	Theory						Credits
	No.of Periods PerWeek			FullMarks	:	100	03
2015404	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CourseObjective:
1. Tolearnbasicprinciplesofbuildingplanninganddrawing.
2. Toknowgraphicalrepresentationofvariouscomponentsofbuildings.
3. Todrawcompleteplanandelevationofabuilding.
4. TolearnbasicsofperspectivedrawingsandComputerAidedDrawings

Contents:Theory

	Nameofthe Topic	Hrs.
Unit -1	Conventions and Symbols: 1.1 Conventions as per IS 962, symbols for different materials such as earth work, brick work, Stone work, concrete, wood work and glass. 1.2 Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations. 1.3 Types of lines-visible lines, centre line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots. Appropriate size of lettering and numerals for titles, sub-titles notes and dimensions. 1.4 Types of scale, criteria for Proper Selection of scale for various types of drawing. 1.5 Sizes of various standard papers/sheets.	04
Unit -2	Planning of Building: 2.1 Principles of planning for Residential and Public building- Aspect, Prospect ,Orientation, Grouping ,Privacy ,Elegance ,Flexibility ,Circulation, Furniture requirements ,Sanitation, Economy. 2.2 Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962. 2.3 Rules and bye-laws of sanctioning authorities for construction work. 2.4 Plot area, built up area, super built-up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio). 2.5 Line plans for residential building of minimum three rooms including water closet (WC), bath and stair case as per principles of planning. 2.6 Line plans for public building-school building, primary health centre, hostel and Library.	10
Unit – 3	Drawing of Load Bearing Structure: 3.1 DrawingofSingle-storyLoadBearingresidentialbuilding(2BHK)withstaircase. 3.2 Data drawing–plan, elevation, section, site plan, schedule of openings, constructionnotes with specifications, area statement, Planning and design of stair case- Rise andTreadforresidentialandpublic building. 3.3 Working drawing–developed plan, elevation, section passing through stair case or WCand bath. Foundationplanof Loadbearingstructure.	16

Unit – 4	Drawing of Framed Structure: 4.1 DrawingofTwostoriedFramedStructure(G+1),residentialbuilding(2BHK)withstaircase. 4.2 Datadrawing– developedplan,elevation,section,siteplan,scheduleofopenings,constructionnoteswith specifications,areastatement. 4.3 WorkingdrawingofFramedStructure– developedplan,elevation,sectionpassingthroughstair caseorWCand bath. 4.4 Foundationplanof FramedStructure. 4.5 DetailsofRCCfooting,Column,Beam,Chajjas,Lintel,Staircase andslab. 4.6 DrawingwithCAD-Drawcommands,modifycommands,layercommands.	14
Unit – 5	Perspective Drawing: 8.1 Definitionofperspectivedrawing,Typesofperspective,termsusedinperspectivedrawing ,principlesusedinperspectivedrawing. 8.2 TwoPointPerspectiveof small objectsonly suchassteps,monuments, pedestals.	04
	Total	48

COURSEOUTCOMES(COs):
1. Interpret the symbols, signs and conventions from the given drawing.
2. Prepare line plans of residential and public buildings using principles of planning.
3. Prepare submission and working drawing for the given requirement of Load Bearing structure
4. Prepare submission and working drawing using CAD for the given requirement of Frame structure
5. Draw two-point perspective drawing for given small objects.

CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015404.01	Interpret the symbols, signs and conventions from the given drawing	2	2	-	-	-	-	-
C2015404.02	Prepare line plans of residential and public buildings using principles of planning	2	2	3	-	-	-	-
C2015404.03	Prepare submission and working drawing for the given requirement of Load Bearing structure	2	2	3	2	1	-	-
C2015404.04	Prepare submission and working drawing using CAD for the given requirement of Frame Structure	2	-	-	3	-	-	-
C2015404.05	Draw two-point perspective drawing for given small objects.	2	-	-	-	-	-	2
Average		2	2	3	2.5	1		2

Suggested TextBook/ReferenceBook:

2. MalikandMayo,CivilEngineeringDrawing,ComputechPublicationLtdNewAsianPublishers,NewDelhi.
3. M.G.ShahandC.M.Kale,Principlesof Perspective Drawing,McGrawHill Publishingcompany Ltd.NewDelhi.
4. Swamy,Kumara;Rao,N,Kameshwara,A.BuildingPlanningandDrawing,CharotarPublication,Anand.
5. Bhavikatti,S.S.,BuildingConstruction,VikasPublicationHouse Pvt.Ltd.,NewDelhi.
6. Mantri,Sandip,AtoZBuildingConstruction,SatyaPrakashan,NewDelhi.
7. Singh, Ajeet, Working withAutoCAD2000, McGraw Hill Publishing company Ltd. New Delhi.Sane,Y.S.,Planningand designofBuilding,AlliedPublishers, NewDelhi
8. R.P.Duggal,BuildingPlanningand Drawing,FPH

TRANSPORTATION ENGINEERING

SubjectCode 2015405	Theory						Credits
	No.of Periods PerWeek			FullMarks	:	100	03
	L	T	P/S	ESE	:	70	
	03	—	—	TA	:	10	
	—	—	—	CT	:	20	

CourseObjective:

1. ToidentifythetypesofroadsasperIRCrecommendations.
2. Tounderstandthegeometricaldesignfeaturesofdifferenthighways.
3. Toperformdifferenttestsonroadmaterials.
4. Toidentifythecomponentsofrailwaytracks

Contents:Theory

	NameoftheTopic	Hrs.
Unit-1	**OverviewofHighway Engineering** 1.1 Roleoftransportationinthedevelopmentofnation,Scopeand Importanceofroadsin India. 1.2 Differentmodesoftransportation– landway,waterway,airway.Meritsanddemeritsofroadway andrailway. 1.3 Generalclassificationofroads. 1.4 Selectionandfactorsaffectingroadalignment.	04
Unit-2	**GeometricDesignofHighway** 2.1 Camber:Definition,purpose,typesasperIRC–recommendations. 2.2 Kerbs:Roadmargin,roadformation,rightofway. 2.3 DesignspeedandvariousfactorsaffectingdesignspeedasperIRC– Recommendations. 2.4 Gradient:Definition,typesasperIRC–Recommendations. 2.5 Sightdistance:Definition,typesasperIRC–recommendations,Simplenumerical. 2.6 Curves:Necessity,types:Horizontal,verticalcurves. 2.7 Extra wideningofroads:numericalexamples. 2.8 Super elevation: Definition, formula for calculating minimum and maximumSuperelevationandmethod of providingsuper-elevation. 2.9 Standardscross-sectionsofnational highwayinembankment andcutting.	12

Unit– 3	**ConstructionofRoadPavements**	
	3.1 Typesofroadmaterialsandtheir Tests – Teston aggregates - Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen-penetration, Ductility, Flash and Firepointtest and Softeningpointtest.	10
	3.2 Pavement – Definition, Types, Structural Components of pavement and their functions.	
	3.3 ConstructionofWBMroad. MeritsanddemeritsofWBMroad.	
	3.4 ConstructionofFlexiblepavement/BituminousRoad, TypesofBitumenanditsproperties.	
	3.5 Cementconcreteroad- methodsofconstruction, AlternateandContinuousBayMethod, Constructionjoints, fillerandsealers, meritsanddemeritsofconcrete roads.Typesofjoints.	
Unit– 4	**BasicsofRailwayEngineering**	
	4.1 ClassificationofIndianRailways, zonesofIndianRailways.	10
	4.2 Permanentway: Idealrequirement, Components; RailGauge, types, factorsaffecting selection ofagauge.	
	4.3 Rail, RailJoints-requirements, types.	
	4.4 Creepofrail: causesandprevention.	
	4.5 Sleepers-functionsandRequirement, types-concretesleepers andtheirdensity.	
	4.6 Rail fixturesandfastenings – fishplate, spikes, bolts, keys, bearingplates.	
Unit– 5	**Trackgeometrics, ConstructionandMaintenance**	
	5.1 Alignment-Factorsgoverningrailalignment.	
	5.2 Track Cross sections – standard cross section of single and double line in cuttingandembankment. Importantterms- permanentland, formationwidth, sidedrains.	
	5.3 Railway Track Geometrics: Gradient, curves-types and factors affecting, gradecompensation, superelevation, limitsofSuperelevationoncurves, cantdeficiency, negative cant, coning ofwheel, tilting ofrail.	12
	5.4 BranchingofTracks, Pointsandcrossings, Turnout- types, components, functionsandinspection. Trackjunctions: crossovers, scissorcrossover, diamondcrossing, track triangle.	
	5.5 Station -Purpose, requirement of railway station, important technical terms, typesofrailwaystation, factors affectingsiteselectionforrailwaystation.	
	5.6 Stationyard: Classification – Passenger, goods, locomotiveandmarshalling yards.Function&draw backsofmarshallingyards.	
	Total	48

COURSEOUTCOMES(COs):

1. Identify the types of roads as per IRC recommendations.

2. Implement the geometrical design features of different highways.

3. Perform different tests on road materials.

4. Identify the components of railway track.

5. Identify the defects in railway track

CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015405.01	Identify the types of roads as per IRC recommendations.	3	3	-	-	-	-	1
C2015405.02	Implement the geometrical design features of different highways	3	-	3	-	-	-	-
C2015405.03	Perform different tests on road materials.	3	-	-	3	-	-	-
C2015405.04	Identify the components of railway track.	3	2	-	-	-	-	-
C2015405.05	Identify the defects in railway track	3	2	-	-	2	-	1
Average		3	2.33	3	3	2		1

SuggestedTextBook:

1. L.R.Kadiyali,Transportation Engineering,KhannaBookPublishingCo.,Delhi

2. KhannaS.K.Justo,CEGandVeeraragavan,A,Highway Engineering,Nem ChandandBrothers,Roorkee.

3. Arora,N.L.TransportationEngineering,KhannaPublishers,Delhi.

4. SaxenaSCandAroraSP,AText bookof RailwayEngineering, DhanpatRai Publication.

5. Birdi,Ahuja,Road,Railways, BridgeandTunnelEng.,StandardBookHouse,NewDelhi.

6. Sharma,S.K.,Principles,PracticeandDesignofHighwayEngineering,S.ChandPublication, NewDelhi

7. SwetaKumari,TransportationEngineering, FPH

HYDRAULICS LAB

SubjectCode 2015406	Practical						Credits
	No.of Periods PerWeek			FullMarks	:	50	01
	L	T	P/S		:		
	—	—	02	Internal(PA)	:	15	
	-	-	-	External(ESE)	:	35	

CourseObjective:

- Tounderstandparametersassociatedwithfluidflowandhydrostaticpressure.
- Toknow headlossandwater hammer influidflowingthrough pipes.
- To learndifferenttypesofpumps andtheiruses.

Contents:Practical

Performanyeightexperiments

1. Use piezometertomeasurepressureatagivenpoint.

2. Use Bourdon'sGaugetomeasurepressureatagiven point.

3. UseUtubedifferentialmanometertomeasurepressuredifferencebetweentwogivenpoints.

4. Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit ofvaryingcross sections.

5. UseReynold'sapparatusto determinetypeofflow.

6. UseFrictionfactorApparatustodeterminefrictionfactorforagivenpipe.

7. Determineminorlossesinpipefittingsdueto suddencontraction andsudden enlargement.

8. DeterminethecoefficientofdischargeforagivenVenturi meter.

9. Determinethehydrauliccoefficientsforsharpedgeorifice.

10. UseCurrentmeterto measurethevelocityof flowofwaterinopenchannel.

11. UsePitottubetomeasurethevelocity offlowofwater in openchannel.

12. Usetriangular notch tomeasurethedischargethroughopenchannel.

13. UseRectangularnotchtomeasurethedischargethroughopenchannel.

14. DeterminetheManning'sconstant orChezy'sconstantforgivenrectangularchannel section.

15. Study&useofwatermeter.

16. Studyofamodel of centrifugalandreciprocatingpump.

PracticalOutcomes:

- Measurepressureanddeterminetotalhydrostaticpressurefordifferentconditions.
- Understandvarious parametersassociated withfluidflow.
- Determine headlossoffluidflowthrough pipes.
- Findthe fluidflow parameters inopenchannels.
- Selectrelevanthydraulicpumpsfordifferentapplications.

CO PO MAPPING

Co Number	CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
C2015406.01	Measurepressureanddeterminetotalhydrostaticpressurefordifferentconditions.	3	2	2	3	2	-	1
C2015406.02	Understandvarious parametersassociated withfluidflow.	3	2	-	-	-	-	-
C2015406.03	Determine headlossoffluidflowthrough pipes.	3	2	2	3	2	-	1
C2015406.04	Findthe fluidflow parameters inopenchannels.	3	2		3	1	-	-
C2015406.05	Selectrelevanthydraulicpumpsfordifferentapplications.	3	2	2	3	2	-	2
Average		3	2	2	3	1.75	-	1

SuggestedTextBook:-

1. HydraulicsLaboratory,Rao&Hasan,NewHeightPublication

2. GhoshandTalapohia-Experimental Hydraulic-KhannaPublishers-NewDelhi

3. HydraulicLabManualCompiled-T.T.T.I.-Chennai–113

ADVANCESURVEYINGLAB

SubjectCode 2015407	Practical							Credits
	No.of Periods PerWeek			FullMarks	:	50		
	L	T	P/S		:			01
	—	—	02	Internal(PA)	:	15		
	-	-	-	External(ESE)	:	35		

Course Objective:

- Toknowmethodsof planesurveying,Theodolite surveyingandtheiruses.
- Tolearntacheometricsurveyingandcurvesetting.
- Tounderstandthe principlesofElectronicDistanceMeasurementandTotalstation andtheiruses.
- Toknow theconceptofRemoteSensing, GPSand GIS.

Contents:Practical

Performanyeightexperiments:

1. Useplanetable surveyto prepareplansofaplotofsevensidedclosedtraversebyRadiationMethod.

2. Useplanetable survey to prepareplans,locatedetailsbyIntersectionMethod.

3. Useplanetablesurvey toprepareplans,locatedetailsbyTraversingMethod.
4. Use plane table survey to carry out Survey Project for closed traverse for minimum five sides aroundabuilding.
5. Usetransit theodolitetomeasureHorizontalandVertical anglebyDirectMethod.
6. Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Theodolite SurveyProject.
7. UseTheodoliteasaTacheometer tocomputereducedlevelsandhorizontaldistances.

8. Set outacircular curvebyRankine'sMethodofDeflection Angles.
9. UsemicroopticTheodolitetoMeasure HorizontalanglebyDirectMethod.
10. UseEDMtomeasure horizontal distance.
11. UseTotalstationinstrumenttomeasurehorizontaldistances.
12. Use Totalstationinstrument tomeasurevertical angle.
13. UseTotalstationinstrumenttocarry outSurveyProject forclosedtraverseforminimum fivesides.
14. Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total StationSurveyProject.
15. UseGPSto locate the coordinatesofastation.

PracticalOutcomes:

- PrepareplansusingPlaneTableSurveys.
- PrepareplansusingTheodolitesurveys.
- FinddistancesandelevationsusingTacheometer.
- MakemeasurementsusingTotalStation.
- Locatecoordinatesofsurveystations usingGPS

CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015407.01	PrepareplansusingPlaneTableSurveys.	3	-	-	1	-	2	2
C2015407.02	PrepareplansusingTheodolitesurveys.	3	-	-	1	-	2	2
C2015407.03	FinddistancesandelevationsusingTacheometer.	3	2	1	-	-	1	-
C2015407.04	MakemeasurementsusingTotalStation.	-	2	1	-	1	-	-

C2015407.05	Locatecoordinatesofsurveystations usingGPS	3	-	-	2	-	1	1
Average		3	2	1	1.33	1	1.5	1.66

ReferenceBook :

1. Kanetkar,T.P.;Kulkarni,S.V., SurveyingandLevellingPart IandII, PuneVidyarthiGruhPrakashan,Pune.
2. Basak,N.N.,SurveyingandLevelling,McGrawHillEducation(India)Pvt.Ltd.,Noida.
3. Duggal,S.K.,SurveyIandSurveyII,TataMcGraw HillEducationPvt.Ltd.,Noida.
4. Saikia,MD.;Das.B.M.;Das. M.M.,Surveying PHILearningPvt.Ltd., NewDelhi.
5. Subramanian,R.,SurveyingandLevelling,OxfordUniversityPress.NewDelhi.

THEORYOFSTRUCTURE LAB(TW)

SubjectCode 2015408	Practical						Credits
	No.ofPeriods PerWeek			FullMarks	:	25	02
	L	T	P/S	Internal	:	07	
	—	—	04	External	:	18	
	-	-	-		:		

CourseObjective:
1. Tounderstandandanalyzestress&strain,shearforce&bending moment.
2. Tostudybehaviorofcolumn.
3. Tolearnhingeaction.
4. Toanalyzedeflectionofbeams

Contents:Practical

1. ToVerifyStraininanexternallyloadedbeamwiththehelpofastraingaugeindicator

   andtoverifytheoretically.

2. TostudybehaviorofdifferenttypesofColumns:(i)Bothendsfixed(ii)OneendfixedandotherPinned(iii)Bothendspinned(iv)Oneendfixedandotherfree.

3. TofindEuler'sbucklingloadfordifferenttypesofColumns:(i)Bothendsfixed(ii)Oneendfixedandotherpinned.(ii)Bothendspinned (iv)Oneendfixedandotherfree.

4. ToStudytwohingedarchforthehorizontal displacementoftherollerendforagivensystemofloadingandtocomparethesamewiththoseobtainedanalytically.

5. DeterminationofShearforceandbendingmomentofbeam.

6. Compressiontestonmetal.

7. Determinationofdeflectionofbeam.

8. Determinationofmoment ofInertiaofflywheel.

PracticalOutcomes:
1. Interpretshearforce&bendingmoment.
2. Interpretbucklingofcolumn.
3. Interprettheresultofhingeaction.

CO PO MAPPING

Co Number	CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C2015408.01	Interpretshearforce&bendingmoment.	2	_	3	3	2	_	_
C2015408.02	Interpretbucklingofcolumn.	2	3	3	2	_	_	_
C2015408.03	Interprettheresultofhingeaction.	2	3	3	2	_	_	1
Average		2	3	3	2.33	2		1

TextBook/ReferenceBook:
1. Theoryofstructures,S.Ramamrutham,Dhanpatrai&Sons.
2. Mechanicsofstructures,S.B.Junnarkar,CharotarpublishingHouse,Anand

<div align="center">**BUILDINGPLANNINGANDDRAWING(TW)**</div>

SubjectCode 2015409	Practical						Credits
	No.of Periods PerWeek			**FullMarks**	:	50	
	L	**T**	**P/S**	**Internal(PA)**	:	15	02
	—	—	04	**External(ESE)**	:	35	
	-	-	-	_	:	_	

CourseObjectives:

- Tolearnthebasicprinciplesofbuildingplanninganddrawing.
- Tomakegraphicalrepresentationofvariouscomponentsofbuildings.
- Todrawcompleteplanandelevationofabuilding.
- TolearnbasicsofperspectivedrawingsandComputerAidedDrawings.

<div align="center">## Contents:-TermWork</div>

1. Drawvarioustypesoflines,graphicalsymbolsformaterials,doorsandwindows,symbolsforsanitary,watersupplyandelectricalinstallationsandwriteabbreviationsasperIS962.

2. Drawlineplanofanexistingbuildingtothesuitablescale.

3. Draw line plans to suitable scale for any one Public Buildings from the following (School Building, Primary HealthCentre,Hostel and Library).

4. Drawsubmissiondrawingtothescale1:100ofasinglestoreyloadbearingresidential building(2BHK)withflatroofandstaircaseshowing:

   (a) Developedplanandelevation

   (b) Foundationplan

   (c) Siteplan(1:200),areastatement

5. Drawsubmissiondrawingtothescaleof1:100of(G+1)FramedStructureResidentialBuilding(2BHK)withflatroofand staircaseshowing:

   a) Developedplan.

   b) Elevation.

   c) Siteplan(1:200)andareastatement.

6. Drawtheabovementioneddrawingatserialnumber05usingCADsoftwareandenclosetheprintout.
   a) Developedplan.
   b) Elevation.
   c) SectionpassingthroughStaircase.
   d) Foundationplan.
   e) Siteplan(1:200),areastatement.

7. Drawworkingdrawingforabovementioneddrawingatserialnumber05showing:
   a) Foundationplantothescale1:50
   b) DetailedenlargedsectionofRCCcolumnandfootingwithplinthfilling.
   c) DetailedenlargedsectionofRCCBeam,LintelandChajjas.
   d) DetailedenlargedsectionofRCCstaircaseandslab.

8. Drawtwopointperspectivesdrawingofsmallobjects-steps,monuments,pedestals(anyone)scale1:50
   a) Drawplan,elevation,eyelevel,pictureplaneandvanishingpoints

   b) Drawperspectiveview.

Practicaloutcomes:

- Interpretthesymbols,signsandconventionsfromthegivendrawing.
- Preparelineplansofresidentialandpublicbuildingsusingprinciplesofplanning.
- Prepareworkingdrawingforthegivenrequirementof LoadBearingStructure.
- Prepareworkingdrawingusing CAD forthegivenrequirementof FramedStructure.
- Drawtwo-pointperspectivedrawingforgivensmallobjects.

CO PO MAPPING

Co Number	CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
C2015409.01	Interpretthesymbols,signsandconventionsfromthegivendrawing.	3	–	–	–	–	–	1
C2015409.02	Preparelineplansofresidentialandpublicbuildingsusingprinciplesofplanning	–	3	–	–	2	–	–
C2015409.03	Prepareworkingdrawingforthegivenrequirementof LoadBearingStructure	–	3	–	–	–	2	1
C2015409.04	Prepareworkingdrawingusing CAD forthegivenrequirementof FramedStructure	–	3	–	2	–	–	–
C2015409.05	Drawtwo-pointperspectivedrawingforgivensmallobjects.	3	–	2	–	–	–	–
Average		3	3	2	2	2	2	1

SuggestedTextBook/RefrenceBook:-

1. Shah.M.G.Kale,CM,Patki,S.Y.,BuildingDrawing,McgrawHillPublishing
2. MalikandMayo,CivilEngineeringDrawing,ComputechPublicationLtd
3. M.G.ShahandC.M.Kale,PrinciplesofPerspectiveDrawing,McgrawHill
4. Swamy,Kumara;Rao,N,Kameshwara,A.,BuildingPlanningandDrawing,CharotarPublication,Anand.
5. Bhavikatti,S.S.,BuildingConstruction,VikasPublicationHousePvt.Ltd.,Delhi.
6. Mantri,Sandip,AtoZBuildingConstruction,SatyaPrakashan,NewDelhi.
7. Singh,Ajit,WorkingwithAutoCAD2000,McgrawHillPublishingcompanyLtd.
8. Sane,Y.S.,PlanninganddesignofBuilding,AlliedPublishers,NewDelhi.

TRANSPORTATIONENGINEERING (TW)

SubjectCode 2015410	TermWork						Credits
	No.of Periods PerWeek			FullMarks	:	25	01
	L	T	P/S	Internal(PA)	:	07	
	—	—	02	External(ESE)	:	18	

CourseObjective:

1. ToidentifythetypesofroadsasperIRCrecommendations.
2. Tounderstandthegeometricaldesignfeaturesofdifferenthighways.
3. Toperform differenttestsonroadmaterials.
4. Toidentifythecomponentsofrailwaytracks.

CONTENTS:-TERMWORK

PerformanyeightExperiments/ Study

1. DrawthesketchesshowingstandardcrosssectionsofExpressways,NH,SH,MDR,ODR.
2. FlakinessandElongationIndexofaggregates.
3. AngularityNumberofaggregates.
4. Aggregateimpacttest.
5. LosAngelesAbrasiontest.
6. Aggregatecrushingtest.
7. Penetrationtestofbitumen.
8. Softeningpointtestofbitumen.
9. DuctilitytestofBitumen.
10. Visittheroadofanyonetype(flexibleorrigid)toknowthedrainagecondition.
11. Visittorailwaytrackforvisualinsectionoffixtures,fastenersandyards.

PracticalOutcomes:

1. IdentifythetypesofroadsasperIRCrecommendations.
2. Implementthegeometricaldesignfeaturesofdifferenthighways.
3. Performdifferenttestsonroadmaterials.
4. Identifythecomponentsofrailwaytrack.
5. Identifythedefectsinrailwaytrack

CO PO MAPPING

Co Number	CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
C2015410.01	IdentifythetypesofroadsasperIRCrecommendations.	3	2	—	—	-	—	1
C2015410.02	Implementthegeometricaldesignfeaturesofdifferenthighways.	—	3	—	—	2	—	1
C2015410.03	Performdifferenttestsonroadmaterials.	—	—	3	3	2	—	—
C2015410.04	Identifythecomponentsofrailwaytrack.	3	—	1	—	-	—	—
C2015410.05	Identifythedefectsinrailwaytrack	—	3	—	—	2	1	1
Average		3	2.66	2	1.5	2	1	1

Reference Book:
1. L.R.Kadiyali,TransportationEngineering,KhannaBookPublishingCo.,NewDelhi
2. KhannaS.K.,Justo,CEGandVeeraragavan,A.,HighwayEngineering, NemChandandBrothers,Roorkee.
3. Arora,N.L.TransportationEngineering,KhannaPublishers,Delhi.
4. SaxenaSCandAroraSP,AText bookofRailwayEngineering, DhanpatRai Publication.
5. Birdi,Ahuja,Road,Railways,BridgeandTunnelEng.,StandardBookHouse,Delhi.
6. Sharma,S.K.,Principles, PracticeandDesignof HighwayEngineering,S.Chand
7. Duggal,AjayK.andPuri,V.P.,LaboratoryManualinHighway Engineering,NewAgeInternational (P)Limited,Publishers,NewDelhi.
8. Subramanian,K.P.,Highway,Railway,AirportandHarborsEngineering,SciTechPublications,Hyderabad

TERMWORK
COURSEAUTOCAD/STAAD.PRO/OTHERS(TW)

SubjectCode 2015411	TermWork						Credits
	No.of Periods PerWeek			**FullMarks**	:	50	**02**
	L	**T**	**P/S**	**Internal(PA)**	:	15	
	—	—	04	**External(ESE)**	:	35	